

Claims

1. A cooling suit to be worn on a wearer, comprising:
a cloth part;

at least one air inlet provided at said cloth part
and configured to introduce outside air into the interior
of said cloth part;

at least one air outlet provided at said cloth part
and configured to extract the air within the interior of
said cloth part to the exterior;

at least one air-blowing means for discharging the
air in a space between said cloth part and the wearer's
body or an undergarment to the exterior, thereby forcibly
causing air-streams within said space;

at least one clearance holding means, provided to
cover that surface of the or each air-blowing means which
opposes to the wearer's body or to the undergarment, and
configured to hold a predetermined clearance between the or
each air-blowing means and the wearer's body or the
undergarment;

electric-power source means for supplying electric
power to the or each air-blowing means; and

air-leakage preventing means for preventing the air-
streams flowing between said cloth part and the wearer's
body or the undergarment, from leaking to the exterior from
a lower end of said cloth part;

wherein the or each air-blowing means introduces the

outside air into the interior of said cloth part through the or each air inlet to cause the introduced air to flow within said space and substantially parallelly to a wearer's body surface, thereby increasing a temperature gradient near the wearer's body surface to thereby cool the wearer's body, and thereby contacting the air-streams flowing within said space with perspiration from the wearer's body so as to vaporize the perspiration from the wearer's body to thereby cool the wearer's body by utilizing an effect to take away an evaporation heat from the surroundings upon evaporation of the perspiration.

2. A cooling suit to be worn on a wearer, comprising:
a cloth part;

at least one air inlet provided at a lower portion of said cloth part and configured to introduce outside air into the interior of said cloth part;

at least one air outlet provided at an upper portion of said cloth part and configured to extract the air within the interior of said cloth part to the exterior;

at least one sideward-flow fan configured to feed outside air into a space between said cloth part and the wearer's body or an undergarment, thereby forcibly causing air-streams within said space;

electric-power source means for supplying electric power to the or each air-blowing means; and

air-leakage preventing means for preventing the air-streams flowing between said cloth part and the wearer's

body or the undergarment, from leaking to the exterior from a lower end of said cloth part;

wherein the or each sideward-flow fan introduces the outside air into the interior of said cloth part through the or each air inlet to cause the introduced air to flow within said space and substantially parallelly to a wearer's body surface, thereby increasing a temperature gradient near the wearer's body surface to thereby cool the wearer's body, and thereby contacting the air-streams flowing within said space with perspiration from the wearer's body so as to vaporize the perspiration from the wearer's body to thereby cool the wearer's body by utilizing an effect to take away an evaporation heat from the surroundings upon evaporation of the perspiration.

3. A cooling suit to be worn on a wearer, comprising:
a cloth part;

at least one air-flow opening provided at said cloth part and configured to extract air within the interior of said cloth part or to introduce outside air into the interior of said cloth part;

at least one air-blowing means, provided at that position of said cloth part which corresponds to the or each air-flow opening, and configured to forcibly cause air-streams in a space between said cloth part and the wearer's body or an undergarment;

electric-power source means for supplying electric power to the or each air-blowing means; and

an air-permeating region which is a predetermined region of said cloth part positioned oppositely to the or each air-flow opening across said space and which is made of a highly air-permeable material;

wherein the or each air-blowing means introduces the outside air into said space through the or each air-flow opening or through said air-permeating region to cause the introduced air to flow within said space and substantially parallelly to a wearer's body surface, thereby increasing a temperature gradient near the wearer's body surface to thereby cool the wearer's body, and thereby contacting the air-streams flowing within said space with perspiration from the wearer's body so as to vaporize the perspiration from the wearer's body to thereby cool the wearer's body by utilizing an effect to take away an evaporation heat from the surroundings upon evaporation of the perspiration.

4. A cooling suit to be worn on a wearer, comprising:
a cloth part;

partitioning means for partitioning a space between said cloth part and an undergarment into upper and lower partial spaces;

at least one air-blowing means, provided at said partitioning means, and for forcibly causing air-streams within said space between said cloth part and the wearer's body or the undergarment;

electric-power source means for supplying electric power to the or each air-blowing means; and

an air ventilating portion, provided at at least one of an upper portion and a lower portion of said cloth part, and configured to extract the air-streams within said space to the exterior or to introduce outside air into said space;

wherein the or each air-blowing means introduces the outside air into said space through said air ventilating portion or through an end portion of said cloth part to cause the introduced air to flow within said space and substantially parallelly to a wearer's body surface, thereby increasing a temperature gradient near the wearer's body surface to thereby cool the wearer's body, and thereby contacting the air-streams flowing within said space with perspiration from the wearer's body so as to vaporize the perspiration from the wearer's body to thereby cool the wearer's body by utilizing an effect to take away an evaporation heat from the surroundings upon evaporation of the perspiration.

5. The cooling suit of any one of claims 1, 2, 3 and 4, further comprising air guiding means provided within said space and for flowing the air-streams along predetermined paths within said space.

6. The cooling suit of any one of claims 1, 2, 3 and 4, wherein said electric-power source means comprises a fuel cell.

7. The cooling suit of any one of claims 1, 2, 3 and 4, wherein said electric-power source means supplies

electric power to the or each air-blowing means via cord.

8. The cooling suit of claim 3 or 4, further comprising a backing cloth attached to said cloth part,

wherein said cloth part is made of a highly air-permeable material at all regions of said cloth part, and

wherein said backing cloth includes that region corresponding to an upper portion of said cloth part which is made of a highly air-permeable material, and said backing cloth includes that region corresponding to a remaining region of said cloth part other than the upper portion of said cloth part which is made of a substantially air-impermeable material.

9. The cooling suit of claim 8, wherein upon applying a pressure of 5Pa to said cloth part and said backing cloth,

said material used for said region of said backing cloth corresponding to said upper portion of said cloth part and for said cloth part, is to attain an air volume of at least $2\text{cc}/\text{cm}^2/\text{sec}$ which passes through said cloth part and said backing cloth corresponding to said air-permeating region per unit time and per unit surface area, and

said material used for said backing cloth in the remaining region other than the air-permeating region, is to attain an air volume of at most $1\text{cc}/\text{cm}^2/\text{sec}$ which passes through the remaining region per unit time and per unit surface area.

10. The cooling suit of claim 8, wherein said backing cloth is formed of a highly air-permeable material and is

obtained by laminating a substantially air-impermeable material to the region of said backing cloth which corresponds to the remaining region other than the upper portion of said cloth part.

11. The cooling suit of claim 3 or 4, wherein said cloth part is made of a highly air-permeable material, and is laminated with a less air-permeable material at a reverse side of said cloth part at portions for preventing air leakage.

12. The cooling suit of any one of claims 1, 2, 3 and 4, wherein the or each air-blowing means is detachably mounted on said cloth part by a magic tape or sheet-like magnet.

13. The cooling suit of any one of claims 1, 2, 3 and 4, wherein the or each air-blowing means includes: a frame; and a ring-shaped member formed around said frame and having at least two cut-outs,

wherein said cooling suit further comprises retaining means mounted at a mounting position of the or each air-blowing means and for retaining the or each air-blowing means, said retaining means having at least two engaging pawls formed therein, and

wherein said engaging pawls and said cut-outs are aligned with each other and the or each air-blowing means is abutted on said retaining means, and then the or each air-blowing means is turned so that those portions of said ring-shaped member which are peripherally positioned to

face to said cut-outs, are engaged with said engaging pawls, respectively, to thereby mount the or each air-blowing means to said retaining means.

14. The cooling suit of any one of claims 1, 2, 3 and 4, wherein the revolution number of the or each air-blowing means is changed by a PWM modulating method.

15. The cooling suit of any one of claims 1, 2, 3 and 4, further comprising a controlling circuit and a receiving circuit,

wherein said electric-power source means, said controlling circuit and said receiving circuit are associated with the or each air-blowing means, and

wherein the driving operation of the or each air-blowing means is controlled by wirelessly transmitting a signal to said receiving circuit from exterior transmitting means.

16. The cooling suit of any one of claims 1, 2, 3 and 4, further comprising a controlling circuit and a receiving circuit both associated with the or each air-blowing means,

wherein the driving operation of the or each air-blowing means is controlled by wirelessly transmitting a signal to said receiving circuit from exterior transmitting means.

17. The cooling suit of claim 15 or 16, wherein said receiving circuit has at least 1,000 pieces of unique communications identification codes.

18. The cooling suit of claim 15 or 16, wherein the

driving operation of the or each air-blowing means is controlled, for each air-blowing means, or for each group when said air-blowing means are divided into several groups.

19. The cooling suit of any one of claims 1, 2 and 3, wherein the or each air-blowing means is mounted on a reverse side of said cloth part in a manner that the rotational axis of the or each air-blowing means is substantially perpendicular to a surface of the wearer's body or of the undergarment.

20. The cooling suit of any one of claims 1, 2 and 3, wherein the or each air-blowing means is mounted at a predetermined position of a reverse side of said cloth part, so that, that end surface of the or each air-blowing means which opposes to said cloth part, is substantially flush with an obverse surface of said cloth part.

21. The cooling suit of any one of claims 1, 2 and 3, wherein the or each air-blowing means has an end surface outwardly protruded from an obverse surface of said cloth part, by a distance of at most 5mm.

22. The cooling suit of any one of claims 1, 2 and 3, wherein the or each air-blowing means is provided at that position of said cloth part, which is slightly shifted from the flank portion to the back portion of said cloth part.

23. The cooling suit of claim 3, wherein the or each air-blowing means is a sideward-flow fan mounted at a predetermined position of a reverse surface of said cloth part.

24. The cooling suit of any one of claims 1, 2, 3 and 4, wherein the or each air-blowing means is a fan, and

wherein said fan comprises a circuit portion having a waterproof treatment applied thereto.

25. The cooling suit of claim 3, further comprising at least one clearance holding means, provided to cover that surface of the or each air-blowing means which opposes to the wearer's body or to the undergarment, and configured to hold a predetermined clearance between the or each air-blowing means and the wearer's body or the undergarment.

26. The cooling suit of claim 1 or 25, wherein the or each clearance holding means has elasticity and can be readily moved in a pressed direction when pressed from the exterior.

27. The cooling suit of claim 1 or 25, wherein the or each air-blowing means includes a frame having an attachment portion for the or each clearance holding means.

28. The cooling suit of claim 3, wherein said cloth part has an upper portion acting as said air-permeating region.

29. The cooling suit of claim 4, wherein said air ventilating portion comprises a predetermined region of said cloth part and is made of a highly air-permeable material.

30. The cooling suit of any one of claims 1, 2, 3 and 4, further comprising a fastener or magic tape as means for opening and closing a front portion of said cloth part.

31. The cooling suit of any one of claims 1, 2, 3 and 4, wherein said cloth part is made of a material without water absorptivity.

32. The cooling suit of claim 3 or 4, wherein said cloth part includes a predetermined region having a water repellent treatment applied thereto.

33. The cooling suit of any one of claims 1, 2, 3 and 4, wherein said cloth part has a heat ray reflecting treatment applied thereto.

34. The cooling suit of any one of claims 1, 2, and 3, said cloth part includes that portion corresponding to the or each air-blowing means which is made of a mesh-like material.

35. The cooling suit of any one of claims 1, 2, 3 and 4, further comprising a spacer configured to ensure said space, said spacer being mounted on a reverse side of said cloth part at a region where said cloth part and the wearer's body or undergarment are apt to closely contact with each other.

36. The cooling suit of claim 4, wherein the or each air-blowing means is a fan, and

wherein said fan is detachably mounted, together with said electric-power source means, on a specific belt to be used inside said cloth part such that said fan is arranged between said cloth part and the wearer's body or undergarment.

37. The cooling suit of claim 2, wherein the or each

air outlet has a laterally elongated cut-out provided at an upper portion of a back portion of said cloth part, and

wherein said cut-out is covered by a mesh, or said cooling suit further comprises at least one spacer arranged around said cut-out.